Forgetting Matter:
Pascal on rhetoric and the mathematics of the ideal villa

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The tension between geometry and matter, and so between geometry and architecture, has a long philosophical history. This paper traces part of that history, interwoven with the history of rhetoric, with reference to Robin Evans' The Projective Cast, Architecture and its Three Geometries,[i] *and to Colin Rowe's essay, 'The Mathematics of the Ideal Villa' (1947).* [ii] *In 1657 or 1658, Pascal wrote two short treatises on the rhetorical function of geometry titled* De l'esprit géométrique, *and* L'Art de persuasion. *In these writings, Pascal burdens geometry with the demand that the truth of matter be articulate, and persuasively demonstrated.*[iii]

Architecture has as its primary condition the geometry of a site. The surveyor/architect has historically grounded the foundations of a building not just in the soil, but in the cosmos itself. A most graphic example in the ancient world is that of the centring of a Roman Town or military encampment at the intersection of the *cardo* and *decanamus*, the *axis mundi* of the surveyor's rod drawing together what Martin Heidegger called 'the fourfold' of earth, sky, divinities and mortals.[iv] The history of this wedding of architectural matter to geometry probably has two great apotheoses in the history of architecture. The first is the Pantheon by the Emperor Hadrian around the year 120 CE, where the geometry of the section is the same as that of the plan. It was designed to accommodate all the gods in its insistent circularity. The other architecture famous for geometry is that of the Cathedrals of the Paris Basin, built between the twelfth and the thirteenth centuries. The expression of order of the world is through geometry as a generative condition, dependent on number as a mode of disclosure, in its most Platonic guise, a pre-condition for divine revelation. The most famous is perhaps that at the Cathedral of Chartres, where the masons used their own measuring rules to ensure the maintenance of a geometric order in plans, and facades, even in the upper reaches of the building hidden from view in the *triforia* and roof spaces. The labyrinth in the floor weds the geometry of the cosmos to the path of a pilgrim on their knees, and the abstract world and the flesh meld together.

'Where there is matter, there is geometry,'[v] writes Kepler (1571–1630), and in geometry you find the thoughts of God. While the medieval masons married matter and geometry in a dialectical dependency, abstract delights of geometry have their own temptations. There is a strong Gnostic tendency in this history, prioritising the abstract over sensory experience. The Gnostics were initially pagan pre-Christian cults popular in Asia Minor, Palestine, and Egypt, especially in Alexandria. [vi] Later Gnostic groups led by a man named Basil, and another competing group led by Valentinus, were influenced by Christianity. They correspondingly had an impact on early Christian writings, notably the Gospel of John. Gnostic groups flourished about the third century BCE to the second century CE. They believed their true selves were in the *pleroma* beyond the seventh heaven, and that the God of the Old Testament was a nasty evil demiurge, who imprisoned them in the world we ordinarily know. The matter of this world, especially human flesh, was always something of a problem for Gnostics: matter was something to be repudiated, scourged and shriven. For a believer, the sand that you can slip through your fingers is contagion, evil muck. Only the elite were permitted salvation through renunciation of the material earth. So what would Gnostic geometry look like: happily free from the agency of evil matter, or so embodied in this world, however abstract, to render it too suspicious of being a foul miasma?

Contrary to such dualistic belief, through matter and mathematics, architecture embodies geometry. In his book, *The Projective Cast*, Robin Evans identifies three geometries in the history of architecture and mathematics. The first derives from Euclid's *Elements*, with its focus on point, line and plane, and the figures of the square, circle and rectangle. Evans quotes Serlio's observation that without geometry, the architect is no more than a despoiler of stones, and that 'flowers picked from Euclid's garden would endow a building with reason.'[vii] The second geometry is perspective geometry, dependent on that lie that is the eye, reducing the world to an infinite point at which parallels never meet, distorting true measure and so universal order along its lineal pathways.[viii] The third geometry Evans leaves a mystery until near the end of his book, teasing on the way that the third geometry might be dependent on the mathematics of surfaces in the stereometric geometry applied to stone cutting,[ix] or after Merleau-Ponty wedding Euclidian, perspective and Cartesian geometries, where the lines of perspective actually do meet at an infinite resolution of order. Jacques Lacan chimes that these three are in an unholy alliance.[x] The third geometry possibly presents itself in Gaspard Monge's development of descriptive geometry in his *Géométrie descriptive* of 1799, so skilfully adopted in the history of engineering in the nineteenth century, and re-introduced to architecture by the end of the century.[xi] Another teasing possibility is in the history of ruled surfaces, whose possible love-child is seen in contemporary

generative geometries in an architecture of surfaces. We find at the end of Evans book, that the third geometry is the geometry of signs, a 'signified geometry,' where the thing symbolised is geometry itself.[xii] Architects of the early twentieth century, fascinated by Einstein and the possibilities of a non-Euclidean *n*-dimension present geometry *metaphorically*. Evans writes:

> If geometry can only be alluded to metaphorically, if it can be signified but not used, it follows that it cannot be the signifier in the way that, for example, the equilateral triangle was the signifier of the Holy Trinity in seventeenth-century art and architecture. Instead, *geometry itself* has to be the thing symbolised or represented. It becomes the subject matter.[xiii]

Evans had in mind the architecture of Van Doesberg, as well as Erich Mendelsohn's Einstein Tower at Potsdam (1919-21), and the Proun Rooms of El Lissitsky of 1923. The same insight is expressed by Colin Rowe in his essay, 'The Mathematics of the Ideal Villa,' an essay first published in the *Architecture Review* of 1947. Rowe was not writing so much in response to the metaphysical transformation of non-Euclidean geometry, but in regard to the allusive quality of Le Corbusier's villas – the Villa Savoye at Poissy (1929-1931), and the Villa Stein at Garches (1927). These villas are compared to works by Palladio, the Villa Capra-Rotunda at Vicenza, (c.1550), and the Villa Foscari (or Malcontenta di Mira, c. 1550-60). According to Rowe, Palladio lived in a social setting informed by the 'quite unassailable' position of geometry informed by Platonic and Pythagorean speculation, where proportion is seen as a projection of the 'harmony of the universe.' He argues that Le Corbusier expressed similar convictions about proportion and geometry, but that culture had changed irrevocably in the eighteenth century, when 'proportion became a matter of individual sensibility and private inspiration.'[xiv]

Rowe goes on to observe the dialectic of intention and accident in the planning arrangements of the Villa Stein, between the 'organised and apparently fortuitous. Conceptually, all is clear, but sensuously, all is deeply perplexing.'[xv] The insistent horizontality of the expression of the Villa Stein, due to the construction between equidistant floor slabs, is contrasted to the vertical extension evident in the Malcontenta, with its hierarchical dispensation of volumes centred on a cruciform hall. According to Rowe, Le Corbusier's pushing and pulling of the horizontal forces in his villa end by 'throwing into intense relief the elementary, geometrical substructure of the building.'[xvi] The unfolding of geometry within these works is thus a matter of sensual experience in Rowe's interpretation, rather than being a conceptual abstraction. For Palladio, he argues,

'mathematics is the supreme sanction of the world of forms.'[xvii] Both Le Corbusier's Villa Savoye and Palladio's Villa Capra-Rotunda are seen as ideal villas in an Elysium landscape, both argued to be a cube within a 'Virgilian dreaming:'

> For here is set up the conflict between the absolute and the contingent, the abstract and the natural; and the gap between the ideal world and the too human exigencies of realization here receives its most pathetic presentation.[xviii]

The metaphorical reading of geometry to which Evans recalls is for Rowe expressed as allusion, a rhetorical posturing in Le Corbusier's villas. Palladio had recovered in his villas the mythic Roman world of the virtuous citizen in an Arcadian villa. Rome and the ideal become equated. Le Corbusier on the other hand enters into a game where architecture set between quotation marks, referring:

> to Paris and to Istanbul, or wherever it may be, aspects of the fortuitously picturesque, of the mechanical, of objects conceived to be typical, of whatever might seem to represent the present and the usable past [. . .] That is, one is able to seize hold of all these references as something known; but, in spite of the new power with which they become invested, they are only transiently provocative.[xix]

Rowe accuses Le Corbusier of the 'artificial emptying of a cube,' yet still suggests there is the representation of a 'reasonable order'[xx] in his architecture. It is arguable that architecture has always been a structure of signs, an edifice of quotations, and that geometry is one amongst a series of signs evident in a work. Rather than being an underlying structure, it is simply a participation in a superstructure of architectural language. A characteristic role of geometry in such a history would be its rhetorical role as a vehicle for signs.

It is a distinctive seventeenth century understanding of the role of rhetoric that Blaise Pascal brings to geometry. Around 1657 or 1658, Pascal wrote two short treatises on the rhetorical function of geometry titled *De l'esprit géométrique*, and *L'Art de persuasion*. These treatises are concerned for the role of geometry in the demonstration or persuasion of the truth of the matter. If follows the classical tradition of rhetoric, where rhetoric is used to persuade or uncover truth, a mode of disclosure, rather than and art to manipulate the minds of others through clever speech, associated somewhat unfairly with Sophist rhetoric. Pascal is aware if this historical burden: in

his essay on persuasion Pascal acknowledges 'that the art of persuasion consists as much in that of pleasing as in that of convincing, so much more are men governed by caprice than by reason.'[xxi] However, only God alone can place certain divine truths within the soul, beyond the scope of reason, beyond persuasion, for which rhetoric gives a voice.[xxii]

A more traditional and late medieval understanding of geometry is mediated to subsequent generations of architects and authors by the writings of Alberti, especially his ruminations on order and on *concinnitas*, the harmonious composition of the parts of a building through geometry and symmetry. This marriage of geometry to architecture, and the rhetorical purpose of architecture, is found in the contemporaneous erotic tales of the *Hypnerotomachia Poliphili*, possibly written by Alberti. Drawing extensively on the writings of Alberti, the anonymous author of this late quattrocento work praises geometry as the foundation of architecture. This is most evident in his or her ekphrastic description of the construction of a triumphal arch from a square based geometry, railing against the 'purblind moderns' who do not recognise the underlying order:

> 'It is a golden saying and a celestial adage, that virtue and happiness reside in the mean, as the poet says. Deserting and neglecting this essential point will result only in disorder, and everything will be false, because any part that does not fit with the whole is wrong. Take away order and the norm, and what work can appear satisfying, gracious air dignified?'[xxiii]

The author's subsequent description of the construction of the triumphal arch reads as a much as a treatise on mathematics as it does an architectural how–to manual. In amongst the description of the ornaments, the author uses the language of *concinnitas* from Alberti: 'This is why I have spoken in several places about the proper goal of architecture, which is its supreme invention: the harmonious establishment of the solid body of the building.'[xxiv]

Pascal, as for the author of the *Hypnerotomachia Poliphili*, or even Le Corbusier for that matter, are recovering a late medieval attitude to the role of geometry as a revelation of divine order. Circling around this discourse on geometry and order is one on the nature of *authority* of an individual's own knowledge, and of fidelity to order. Pascal open his treatise on geometry with the statement;

> One can have three chief aims in the study of truth; the first, to discover it, when one seeks for it; the second, to demonstrate it when one possesses it; the last, to distinguish it from falsehood when one examines it.[xxv]

Pascal aims to set out his method, which he considers 'more eminent and faultless, but which men can never achieve; for what goes beyond geometry, transcends us [. . .].'[xxvi] The function of geometry is to educate, and the geometer is obligated to demonstrate what is known or what has been learnt. Pascal sees a problem in this translation in the naming of things, and he argues that the aim is to 'abridge reasoning, and not in order to diminish or to change the idea of things that they reason about.'[xxvii] The aim is to explain the 'true order,' which consists of 'defining everything and proving everything.'[xxviii] He further writes:

> This is what geometry teaches perfectly. It does not define any of these things – space, time, motion, number, equality – nor similar things of which there are many, because these terms so naturally designate the things that they signify, to those who understand the language, that the clarification of them that might be made would bring more obscurity than enlightenment.[xxix]

In other words, geometry has its own language that requires little or no translation to the initiated. He writes that, 'It will perhaps be found strange that geometry is not able to define any of the things that are its principal objects. For it can define neither motion, nor numbers, not space […].' However, geometry 'penetrates into their natures, and reveals marvellous properties of them.'[xxx] Pascal quotes scripture to observe that: 'God has made all things in weight, numbers and proportion' [Wisdom 11:21], observing that these three have a 'reciprocal and necessary connection.'[xxxi] He then posits the circumstances in which human beings dwell between 'two marvellous infinities,'[xxxii] one of greatness, the other of smallness. Even those who cannot fathom Pascal's truths about the world will at least 'admire the greatness and power of Nature in this double infinity.'[xxxiii] For Pascal human beings live between nothing and infinity. At the smallest point in nature, to an imagined enquirer, in his *Pensées* he declares 'I will let him see there a new abyss' [199].[xxxiv]

This abyss of an infinitely small point has a perspectival reference, a raising to symbolic heights of the vanishing point of a constructed edifice, as Erwin Panofsky's *Perspective as Symbolic Form*[xxxv] makes plain. But for Pascal, this geometer's instrument calls up the spectre or ghost of

the infinitely repeating number, a geometer's Witch of Endor, potentially prophetic of some disaster. Pascal declares: 'The eternal silence of these infinite spaces fills me with dread.' [xxxvi] The geometry of the universe betrays a flawed and dystopic order. It is as if the world is akin to an anamorphic construction, where a perspectival point is required to interpret what is presented to the eye as some massive distortion.[xxxvii]

At issue is the extent to which geometry and its manifestation as perspective represents the appearance of something real, or represents or substitutes for the real in the sense of a translation, thus acting as a trope or sign. Rene Magritte's pipe is not a pipe, but the representation or sign of a pipe. This is not the condition Pascal finds in geometry, and so it won't save him from his 'bad infinity.' Geometry in its instrumental use in architecture becomes a matter of faith and fidelity. For Pascal, the truths of the world, even divine truth itself, is revealed to those who know numbers and their unfolding figures.[xxxviii] But geometry, even if a matter of faith, can betray reason. Kepler is a good example of someone 'led astray' by mathematics,[xxxix] his positing of the careers of planets faithfully circular to geometric order underpinned by Platonic assumptions in defiance of an elliptical reality. Such assumptions, even in their 21st century incarnation in generative geometries in architecture where matter is also forgotten, elevate geometry to a divine 'guiding hand.' Similarly, Karsten Harries also argues that Francis Bacon makes mathematics look like an 'idol of the tribe.'[xl]

The relation between architecture and rhetoric is not lost in the period: Guarino Guarini, living in the seventeenth century, wrote that 'Architecture, though dependent on mathematics, is nevertheless an art of adulation.'[xli] However, architecture undergoes a significant transformation in the seventeenth and eighteenth centuries, and comes to share the same philosophic territory of the rhetoricians in response to the new science, which leads to what Dalibor Vesely has described as a problem of 'divided representation.' Instrumental values gain ascendency over the embodiment of truth or meaning in symbolic representation.[xlii] Claims for the revelation of truth are eroded from dialectic and logic, which overcome to a large extent the claims of rhetoric, such that the five traditional parts of rhetoric are seen as a form of deception.[xliii] Rhetoric is necessary to geometry in Pascal's essay, caught between faith and rationality.

Forgetting matter, Pascal attempts to construct his own ideal dwelling in the fabric of geometry, caught between a double infinity, frightened by the abyss of an infinitely repeating number against which his cosmic house is eternally divided. A demonstration of the world idealised in

geometry will always be flawed, because of the double condition of an ideality: the ideal can only be judged in terms of its dialectical relation with the ordinary, the transcendent only efficacious because of its reciprocity with an immanent reality. Geometry's persuasive cast turns itself inside out as rhetorical invention.

Endnotes

[i] Robin Evans, *The Projective Cast, Architecture and its Three Geometries*, Cambridge, Mass., MIT Press, 1995.
[ii] Colin Rowe, 'The Mathematics of the Ideal Villa' (1947), *The Mathematics of the Ideal Villa and Other Essays*, Cambridge. Mass., and London, MIT Press, 1976.
[iii] Blaise Pascal, 'Reflections on Geometry in General, On the Geometrical Mind and The Art of Persuasion (1657-1658).' Trans. Richard H. Popkin, in *Pascal, Selections*, New York and London, Macmillan, 1989, p. 173.
[iv] Martin Heidegger, 'Building, Dwelling, Thinking," in Ed. David Farrell Krell, *Basic Writings*, London, Routledge, 1993, p. 335.
[v] Job Kozhamthadam, *The Discovery of Kepler's Laws: The Interaction of Science, Philosophy, and Religion*, Notre Dame, Ind., University of Notre Dame Press, 1994,170. See also Karsten Harries, *Infinity and Perspective*, Cambridge, Mass.: MIT, 2001, p. 273.
[vi] On Gnostic thought, see Kurt Rudolph, *The Nature and History of Gnosticism*, trans. R.M.Wilson, San Francisco: Harper and Row, 1987; Elaine Pagels, *The Gnostic Gospels*, New York: Random House, 1979.
[vii] Evans, *The Projective Cast*, xxvi-xxvii; Sebastian Serlio, *The Five Books of Architecture*, New York, 1982, fol. 1 recto.
[viii] Evans, *Projective Cast*, p. 123ff.
[ix] Evans, *Projective Cast*, p. 180.
[x] Evans, *Projective Cast*, pp. 125–6; Maurice Merleau-Ponty, *The Visible and the Invisible*, ed. C. Lefort, trans. A Lingis, Evanstone, Ill., 1968, p. 212; Jacques Lacan, 'Anamorphosis,' in *The Four Fundamental Concepts of Psychoanalysis*, ed. Jacques –Alain Miller, trans. Alan Sheridan, New York, 1977, pp. 79–90.
[xi] Evans, *Projective Cast*, p. 323.
[xii] Evans, *Projective Cast*, p. 349.
[xiii] Evans, *Projective Cast*, p. 349.
[xiv] Rowe, 'Mathematics of the Ideal Villa', pp. 8–9.
[xv] Rowe, 'Mathematics of the Ideal Villa', p. 12.
[xvi] Rowe, 'Mathematics of the Ideal Villa', p. 12.
[xvii] Rowe, 'Mathematics of the Ideal Villa', p. 13.
[xviii] Rowe, 'Mathematics of the Ideal Villa', p. 14.
[xix] Rowe, 'Mathematics of the Ideal Villa', p. 15.
[xx] Rowe, 'Mathematics of the Ideal Villa', p. 15.
[xxi] Blaise Pascal, 'Reflections on Geometry in General,' p. 188.
[xxii] Pascal, 'Reflections on Geometry in General,' p. 186.
[xxiii] Francesco Colonna, *Hypnerotomachia Poliphili, The Strife of Love in a Dream*, Trans Joscelyn Godwin, London, Thames and Hudson, 1999, (c1 – c2) pp. 42 – 43.
[xxiv] Colonna, *Hypnerotomachia Poliphili*, (c4) p. 47.
[xxv] Pascal, 'Reflections on Geometry in General,' p. 173.
[xxvi] Pascal, 'Reflections on Geometry in General,' p. 173.
[xxvii] Pascal, 'Reflections on Geometry in General,' p. 175.
[xxviii] Pascal, 'Reflections on Geometry in General,' p. 175.
[xxix] Pascal, 'Reflections on Geometry in General,' p. 176.
[xxx] Pascal, 'Reflections on Geometry in General,' p. 179.
[xxxi] Pascal, 'Reflections on Geometry in General,' p. 179.

[xxxii] Blaise Pascal, 'Reflections on Geometry in General, On the Geometrical Mind and The Art of Persuasion (1657-1658),' 179, 184.
[xxxiii] Blaise Pascal, 'Reflections on Geometry in General, On the Geometrical Mind and The Art of Persuasion (1657-1658),'p. 185
[xxxiv] Blaise Pascal, *Pensées,* 199.Trans. Richard H. Popkin, in *Pascal, Selections*, New York and London, Macmillan, 1989, p. 230.
[xxxv] Erwin Panofsky, *Perspective as Symbolic Form,* trans. Christopher S. Wood, New York, Zone Books, 1997.
[xxxvi] Blaise Pascal, *Pensées,* 201, Harmondsworth, Penguin, 1966, p. 95.
[xxxvii] Rene Descartes, on the other hand, invents rules to support the intuitions that we have about the distortions of perspective. Harries, *Infinity and Perspective*, p. 280.
[xxxviii] Similarly for Galileo: 'Philosophy is written in this grand book, the universe, which stands continually open to our gaze. But the book cannot be understood unless one first learns to comprehend such language and read the letters in which it is composed. It is written in the language of mathematics and its characters are triangles, circles and other geometric figures without which it is humanly impossible to understand a single word of it; without these, one wanders about in a dark labyrinth.' Galileo Galilei (1623), *The Assayer,* in *Discoveries and Opinions of Galileo,* trans. and introduction Stillman Drake, Garden City, NY, Doubleday, 1957, pp. 237–238; Harries, *Infinity and Perspective*, p. 265.
[xxxix] Harries, *Infinity and Perspective*, p. 285.
[xl] Harries, *Infinity and Perspective*, p. 290.
[xli] 'L'Architettura, sebbebe dipenda dalla Matematica, nulla meno essa é un'Arte adulatrice.' Guarino Guarini, *Architettura Civile*, Turin, 1737; reprinted Farnborough, 1964, Trat. I, iii. 3.
[xlii] Vesely observes that divided representation is present in Claude Perrault's distinction between positive and arbitrary beauty, 'a decision that foreshadowed later tensions and conflicts between experience, based on the continuity of tradition, and artificially constructed systems.' Dalibor Vesely, *Architecture in the Age of Divided Representation, The Question of Creativity in the Shadow of Production.* Cambridge, MIT, 2004, p. 177.
[xliii] George A Kennedy, *Classical Rhetoric and its Christian and Secular Tradition from Ancient to Modern Times* (Chapel Hill: University of North Carolina Press, 1980), p. 222.